

## EDITORIAL ARTICLES.

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### CHAPUT ON THE INOSCULATION OF THE URETERS WITH THE INTESTINE.

CHAPUT<sup>1</sup> gives an excellent summary of the literature of the subject of uretero-intestinal anastomosis, and describes the indications and technique of this somewhat unusual operation.

The union of the ureters with the intestine is not at all an unusual condition. It is well known that during the entire life of birds urine is discharged into the cloaca, which receives fæcal matter as well. Even in the human foetus the secretions from the kidneys during the first months empty into the cloaca. This continues until the time when, in the progress of development, the bladder is entirely separated from the rectum.

The establishment of an artificial communication between the ureters and the intestine by means of surgical procedures may be, under certain conditions, of great benefit to the patient. The extensive involvement of the bladder in cancerous or tubercular disease, necessitating either its total resection or merely resection of the base alone, renders such a procedure advantageous. In cases, too, of exstrophy of the bladder it should become possible, after the diverting of the urine into the digestive tract, to extirpate entirely the inflamed and bleeding area of the mucous membrane forming the posterior bladder-wall, and occupying the hypogastric region.

This intestinal exit of urine is also of great service in inoperable cases of vaginal fistula, and in wounds, ruptures, or calculus of the ureter, for in such cases reliance cannot be placed upon direct suture.

The first efforts made to direct the course of the urine into the

<sup>1</sup> Archives Générales de Médecine, January, 1894.

intestine were in cases of exstrophy of the bladder. For the relief of this condition Simon<sup>1</sup> passed a loop of thread through the walls of both the ureter and the rectum, and tied them tightly together. Necrosis occurred at the point of ligation, and a communication resulted. Unfortunately, urine continued to appear at the opening in the skin, although the artificial fistula remained patent. The patient died of pyelonephritis.

Thomas Smith<sup>2</sup> operated on a child of seven, and sutured successively the two ureters into the colon. The lumbar incision was used. The second operation was quickly followed by death. The autopsy showed that on the left side, the first one subjected to operation, the point of exit of the ureter was obliterated, causing hydronephrosis. On the right side, inflammation of the ureter and acute septic pyelonephritis were found.

These fruitless attempts found few imitators, and the question seems to have been held in abeyance for many years. Its answer was next sought from the experimental stand-point.

Glücke and Zoller<sup>3</sup> tried upon dogs the effect of total extirpation of the bladder with subsequent deflection of the ureters sometimes to the skin, sometimes into the rectum. The latter procedure was in all cases unsuccessful.

About the same time Bardenheuer tried to suture a single ureter into the intestine. The animals recovered from the operation, but an autopsy revealed hydronephrosis in each case, evidently due to a contraction of the ureter at its orifice.

Novaro reported to the Italian Surgical Society, in 1887, that he had produced an anastomosis of both ureters with the intestine in three dogs. Two of the animals died; the third recovered, and was finally able to urinate through the anus and to retain urine for considerable periods of time.

Paoli and Busachi<sup>4</sup> reported a number of similar experiments. In some cases the ureters were sutured into the intestine, in others

<sup>1</sup> London Lancet, 1852.

<sup>3</sup> Berliner klinische Wochenschrift, 1881.

<sup>2</sup> St. Bartholomew's Hospital Report, 1879. <sup>4</sup> Medical Congress of Pavia, 1888.

into the bladder itself. These cases are interesting, because in nearly every case a constriction developed at the point of exit of the ureter. Four trials were made. Two of the dogs died, one of pyelonephritis, the other of infiltration of urine. The third presented a dilatation of the intestine with anæmia of the corresponding kidney,—a fact which is explained by the investigations of Albarran, who has shown that hydronephrosis results from gradual contraction, while if the outlet is suddenly closed atrophy of the kidney occurs. The fourth animal made a good recovery.

Tizzoni and Poggi<sup>1</sup> report a series of very complete experiments, but their methods vary considerably from those of other investigators. Briefly, they first isolated a loop of intestine after the method of Thiry. At a subsequent operation they ablated the entire bladder, then sutured the ureters into the artificial intestinal loop, and finally sutured this loop to the neck of the bladder. This is, of course, in a literal sense, an anastomosis of the ureters with the intestine, but the conditions are so different as to render the experiments of little value for purposes of comparison.

Tuffier<sup>2</sup> tried twice to cause the ureter to empty into the rectum. Both animals died of pyelonephritis.

A more extensive series of experiments is reported by Harvey Reed.<sup>3</sup> The author comes to the conclusion that an implantation of a single ureter into the intestine is easy and safe, but that a bilateral implantation is dangerous. Just why two operations, safe in themselves if done on different animals, should be dangerous when done on the same animal is difficult to explain. In six bilateral implantations there were six deaths, either from peritonitis or from hydronephrosis. Three unilateral implantations were performed. In one case union failed; in the second acute nephritis resulted; in the third, however, a perfect cure was obtained, with neither nephritis nor dilatation of the ureter. This last case is to be borne in mind,

<sup>1</sup> *La Riforma medica*, 1888.

<sup>2</sup> *Annales des Maladies des Organes Génito-urinaires*, 1888.

<sup>3</sup> *ANNALS OF SURGERY*, 1892.

for it proves that such an anastomosis can be made successful when skilfully performed and under proper conditions.

Morestin<sup>1</sup> did the bilateral operation ten times. All the cases died from peritonitis, pyelonephritis, or hydronephrosis. In six unilateral operations three died from peritonitis and three from hydronephrosis.

Chaput himself has tried similar experiments upon dogs many times and in a great variety of ways. His results are no better than those of his predecessors. He says, "I believe that the difficulty in obtaining good results in these operations upon dogs is due in part to the very small size of the ureter in the animal, and in part to the great rigidity of the intestinal walls causing the sutures to cut through the tissues and rendering union almost impossible. Moreover, even if the animal escape peritonitis and hydronephrosis, there still remains the great danger of septic infection from the intestinal contents themselves and the consequent pyelonephritis. The experiments upon dogs, therefore, are not to be relied upon to furnish material from which to draw valuable conclusions as to the advisability of similar operations upon man." More satisfactory results could doubtless be obtained from experiments tried upon animals of larger size than the dog, but the practical and economic difficulties are so great as to be practically prohibitory.

The artificial union of the ureter with the intestine has recently been tried again upon man for the purpose of relieving various serious conditions. The first of these cases was operated upon by Küster. The operation consisted of a complete cystectomy for cancer of the prostate. Anastomosis of the ureters with the rectum was effected.<sup>2</sup>

The result was not satisfactory, for the patient died upon the fifth day after the operation. The autopsy showed a purulent peritonitis, and there were many evidences of renal infection. The ureters were not dilated, but the sutures between them and the rectum had not held. The retro-peritoneal glands were infiltrated with carcinomatous deposit.

<sup>1</sup> Société Anatomique, 1892.

<sup>2</sup> Langenbeck's Archiv, 1891.

The next instance in which this anastomosis has been tried was a case operated upon by Chaput himself for the relief of a uretero-vaginal fistula, left after an incomplete vaginal hysterectomy which had been performed for a purulent salpingitis; the ureter had been wounded, and a uretero-vaginal fistula was the result. The fistula was so high up and the orifice so surrounded by a mass of distorted cicatricial tissue that the idea of causing the opening to communicate directly with the bladder had to be abandoned. A nephrectomy had been decided upon, and preparations for its performance had been begun when the article of Reed's appeared, in which this author reports the successful implantation of the ureter of a dog into the animal's intestine. The opportunity seemed a good one to try this procedure upon a human subject, and, after several attempts upon a cadaver, Chaput performed a similar operation upon the patient in question, September 13, 1892.

The abdominal incision was made in the left iliac fossa, beginning above the anterior superior spine of the ilium, and curving at its lower end to the median line. The peritoneal cavity was opened, and the colon and the small intestines were held to one side. The posterior layer of the peritoneum was next divided on a line, ten centimetres in length, parallel with the insertion of the meso-colon. The peritoneum was reflected as far as the vertebral column and the ureter sought for. One of the iliac veins was first opened by mistake, and, finally, after considerable search, what was at first supposed to be the iliac vein was found to be the greatly-distended ureter. This was first picked with a bistoury, to make sure of the diagnosis, and then divided between two clamps.

The anastomosis of the ureter was the next thing attempted. The orifice of the renal portion of the divided ureter was made to meet the colon on its posterior and lateral aspect at a very acute angle. A row of sutures was inserted uniting the serous layers of the two structures along the posterior semicircumference. The intestine was then incised in a direction corresponding to the ureteral orifice, and a corresponding row of sutures uniting the mucous layers

was placed in position. The interior diameter of the ureter was about eight millimetres, and from three to five sutures were placed in each row. The anterior lips were then brought into close apposition by two similar lines of sutures,—the first in the mucous, the second in the serous layers.

Before closing the belly the open end of the vesical portion of the ureter was closed by means of a large silk ligature. A gauze drain was placed in the post-peritoneal space. The abdominal wound was closed by a single row of silkworm-gut sutures. The results of the operation were excellent, fever was entirely absent, and the patient recovered without a single complication.

At the end of a year a comparison of the discharge from the rectum and from the bladder for twenty-four hours gave the following results: Vesical urine, 1250 cubic centimetres; urea, 24 grammes per litre. Liquid material eliminated by the rectum, 270 cubic centimetres; urea, 4.5 grammes per litre. The patient has three liquid movements daily, which contain solid matter in suspension. These passages are easily retained in the rectum, and there is no discomfort experienced. The left kidney is not enlarged, and the amount of urine excreted is fairly abundant. The diminution in the amount of urea in the urine of this side is explained by the fact that secondary changes had occurred in the kidney as a result of the contraction of the orifice of the ureter during the existence of the fistula.

A second case is also reported by Chaput. The patient was a woman, aged forty-five, who entered the hospital (la Salpêtrière) February 4, 1892. Besides all of the typical symptoms of tubercular cystitis, the examination showed tubercular disease to exist in the lungs and also in the hip. A profuse metrorrhagia, occurring every two or three months, had existed four years before; but this had subsided after two years, but she still suffered from severe and continuous hypogastric pain, exaggerated by menstruation.

After her entry into the hospital, a great variety of methods of treatment were tried for the cystitis: boric acid, nitrate of silver, turpentine, and borate of soda were tried in turn for lavage; the

urethra was dilated; a sound was allowed to remain in the bladder for weeks; hot baths were tried; the pains were sometimes slightly relieved, but soon returned with their former severity.

Finally, in July, 1892, a suprapubic section was made. The walls of the bladder were one centimetre thick, and the mucous membrane showed numerous irregular ulcerations. As a result of this operation the patient's general condition improved for some months, but in November the bladder was so greatly contracted that an extremely disagreeable vesical fistula remained, which could not be closed, and which caused the patient much distress.

Encouraged by the success of his first case (*vide supra*), Chaput then decided to suture the ureter into the colon, and on the 25th of November this operation was performed upon the left ureter. A vertical incision was made along the outer border of the left rectus muscle, curving at its lower end nearly to the median line. The intestines were pushed aside, and the posterior layer of the peritoneum was divided, parallel with and outside of the sigmoid flexure of the colon. The ureter was easily isolated, and divided between two clamps. The lower portion was at once ligated, and the suture of the renal portion to the intestine was begun at once. The ureter was of large size, as large as the little finger, and the mucous membrane was thickened and inflamed. One-half of the circumference of the serous layer of the ureter was first sutured to the postero-external face of the colon before the latter was opened. Three fine silk sutures were used. An incision, one centimetre in length, was then made through the wall of the colon, parallel with the orifice of the ureter, and about four millimetres from the first row of sutures. The posterior and anterior lips of the mucous layers and the anterior lip of the serous layers were then united by sutures in the order named. The abdominal wound was treated as in the preceding case. Cure was rapid and complete.

As a result of the operation the patient had about eight watery movements daily. The hypogastric pains and fistula were not especially affected by this preliminary operation.

Three months later the general condition of the patient was fairly good, and there were but four or five passages daily. The anastomosis of the right ureter with the cæcum was decided upon, and this operation was performed on the 1st of March, 1893. The same method was used as in the first operation. The ureter was as large as the thumb, and all of its walls were thickened and congested. There was no fever produced, but she became comatose, and died on the same day. The diarrhœa which had existed was entirely checked; as the anastomosis of the second ureter would have added to this condition, there can be no doubt but that suppression of urine was the immediate cause of death. No autopsy was performed.

The author calls especial attention to the fact that, in this case, in spite of the ureteritis, and the effect of the chloroform, the left kidney bore the anastomosis of the ureter with the intestine for three months, and did not cease to functionate. He concludes, therefore, as a result of this observation, that this form of anastomosis is a favorable one, since, notwithstanding the adverse conditions, the operation itself was successful, and was free from unfavorable complications either on the side of the kidney or on the side of the intestine. The frequency of the discharges from the rectum which decreased towards the last is to be attributed to the polyuria existing in a kidney already diseased. It is fair to assume that eventually the large intestine would have become sufficiently dilated to act as a reservoir for the urine, and so render the evacuations less frequent.

*Operative Technique of the Anastomosis of the Ureter with the Intestine.*—The ureter may be led into the digestive tract at the level of the rectum, of the ascending or of the descending colon, or even into the small intestine. Tizzoni and Poggi have united the ureters with a loop of intestine isolated and opening upon the skin; with the urethra; or with another portion of the intestine.

The inosculation in the region of the rectum seems to Chaput to be contraindicated, since the ureters lie so far distant from that portion of the gut as to make it necessary to denude them for a considerable distance; moreover, it is extremely difficult to place the sutures



properly in the depths of the pelvis. The unsuccessful attempt of Küster appears to support this theory; his sutures did not hold, and the patient died of peritonitis.

Anastomosis with the small intestine offers no advantages, and the urine is likely to interfere with digestion and with absorption.

The ascending and descending portions of the colon are without doubt the points of election for the proper performance of the anastomosis with the ureters.

In performing anastomosis with the ascending and descending colons, Chaput recommends the use of the following incision which he used in his three operations: it commences above at the border of the costal cartilages, about eight centimetres from the median line; it extends to the level of the anterior superior spine of the ilium, and then curves to within about two centimetres from the median line. It is made layer by layer until the peritoneum is reached. This is then opened, the large intestine is recognized, and this together with the neighboring coils of the small intestine is pushed aside, and held by means of a compress in the hand of the assistant.

The posterior parietal layer of the peritoneum is then incised for a distance of ten centimetres in the iliac region. The internal peritoneal lip is seized with the hæmostatic forceps, and with the fingers it is easy to strip up the peritoneum as far as the vertebral column. The entire region is sponged dry, and the ureter can usually be recognized without difficulty. The ureter is grasped by two toothed forceps and divided between them. The inferior portion is at once ligated and replaced.

The superior portion is then held in contact with the postero-internal aspect of the descending colon and sutures are inserted as follows: The posterior lip of the ureteral orifice is first fastened to the still intact intestine by three or four sutures passed through the muscular layers only. The intestine is then incised for about one centimetre several centimetres below the preceding row of sutures. The mucous layers of the posterior lips of the two orifices are immediately sutured together, and finally the anterior lips are united by a

row of sutures through the muscular walls. (Fig. 1.) Some supplementary sutures are next placed at the extremities of the intestinal incision which gapes a little. In case the ureter is too small, and the walls too thin, to stand two layers of sutures, its fixation may be secured by three muco-mucous sutures. The entire end of the ureter should finally be buried at the bottom of a fold of the intestinal wall by means of two rows of sero-serous sutures so placed that it will be completely covered for a distance of about two centimetres. (Figs. 2 and 3.) It only remains to drain the exposed surface with a strip of gauze, and to suture the abdominal wall.

The anastomosis with the ascending colon is performed in precisely the same manner as with the descending.

*The Formation of a Bladder from a Loop of Small Intestine.*—In order to avoid the frequent passages from the bowels that may result from the anastomosis of both ureters, the endeavor may be made to divert them into a loop of small intestine which in its turn empties into the descending colon. This operation should be performed at two separate operations.

At the first of these a portion of the small intestine should be selected not far above the ileo-cæcal valve, and a loop cut out. This loop should be carefully washed out, and the open ends united to one another by invagination. The two ends of the main line of the gut may be united by any convenient method of enterorrhaphy. At the end of five days the belly is reopened, and the hollow ring of intestine should be found somewhat distended by intestinal juice.

At this second operation the two ureters are united with the isolated loop after the mode of procedure indicated above. Finally, the artificial bladder thus formed is made to inosculate with the descending colon through an orifice about one centimetre in diameter.

Chaput has performed this series of operations many times upon dogs, and although the results have been unsuccessful for the reasons already given, he has been able to study the operative technique carefully, and states positively that they can be readily carried out in man.

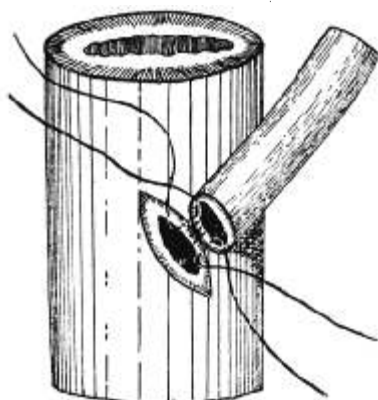


FIG. 1.—Suture of the mucous layers of ureter and intestine.



FIG. 2.—Point of anastomosis buried by infolding the intestinal serosa.

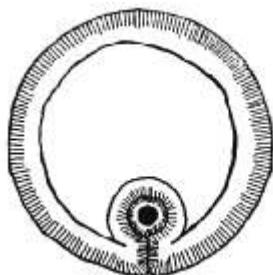


FIG. 3.—Transverse section of wound at point of anastomosis showing the infolded ureter.

He thinks it to be easier and less dangerous to make this anastomosis of the loop of small intestine with the large intestine than with the urethra. Before such a procedure can be adopted as warrantable, it would be necessary to have more reliable data as to the results obtainable from bilateral anastomosis with the intestine, and resort to the creation of such an artificial bladder only after it has been shown that the anastomosis with the colon is necessarily followed by frequent and watery passages from the bowels.

Chaput thinks that the stools would not be more frequent than with the unilateral operation, for the entire extent of the large intestine would be utilized.

*Indications for the Intestinal Anastomosis of the Ureter.*—This operation should not be one of choice, but of necessity; it is applicable only in those cases where other means for the preservation of the kidneys are impossible or are contraindicated.

In cases of uretero-vaginal fistula the classic operations of Simon, Bandl, Schede, or of Poggi should first be tried. If the seat of the fistula is low down, the directing of the ureter into the bladder by the aid of the hypogastric section may be attempted; in those cases, however, where the fistula is at an inaccessible point, the intestinal anastomosis is easier and less fraught with danger than its implantation in the bladder by a laparotomy, as recommended by Bazy. The intestinal anastomosis is much preferable to nephrectomy, which deprives the patient of an organ so necessary for existence.

Unilateral anastomosis is indicated in those cases where the ureter is wounded high up, as may happen during the course of a laparotomy, or as a result of a blow or kick upon the abdomen.

After the removal of a calculus in the ureter, if the ureteral wall is in such a condition that it cannot be united, the intestinal anastomosis will be found of great value.

In a case of cancer of the bladder, where the growth encroaches upon the outlet of one of the ureters, the removal of this portion of the base of the bladder will necessitate the suture of the ureter to

another portion of the bladder; but if the entire resection of the bladder is indicated, the anastomosis with the two parts of the colon is all that can be done.

The same thing holds true in severe cases of tuberculosis rendering entire resection of the organ imperative, although, unfortunately, the renal lesions, which are so apt to exist at the same time, render permanent benefit unlikely.

In exstrophy, Pousson has advised, and Tuffier has executed, a cystorectal anastomosis; but the operation of Tuffier usually leads to a permanent cutaneous fistula. This is not the case with the intestinal anastomosis of the ureters, which obviates entirely this inconvenience, and which is certainly more satisfactory than the ingenious procedures of Segond. The author summarizes his views as follows:

(1) The anastomosis of the ureters with the intestine is an easy and a favorable operation. That it does not necessarily lead to a hydro-nephrosis due to contraction of the orifice of exit, nor to pyelo-nephritis due to ascending infection, is proved by his personal observations.

(2) The bilateral operation, successfully performed by Novaro upon dogs, can certainly be successfully performed upon man.

(3) The exit of urine into the intestine does not cause special inconvenience, and neither impairs digestion nor irritates the mucosa; the stools are somewhat more frequent, but not more so than normal micturition.

(4) The operation is a valuable recourse in certain cases where the more simple methods of intervention are inapplicable.

It is particularly indicated in complete resection of the bladder—cancer, tuberculosis, exstrophy—in fistulas of the ureter, and in wounds and ruptures of the organ, and in certain cases of ureteral calculus.

H. P. DE FOREST.

## ON THE SURGERY AND PHYSIOLOGY OF THE SPLEEN.

THE demonstration was made by Zacaralla in 1549 that the human spleen could be successfully removed. Köberle, Péan, Crédé, and others have also performed the operation upon the human subject.